CLAIMS

1. A thermoacoustic apparatus comprising a first stack sandwiched between a first high-temperature-side heat exchanger and a first low-temperature-side heat exchanger and a second stack sandwiched between a second high-temperature-side heat exchanger and a second low-temperature-side heat exchanger in the inside of a loop tube, wherein a standing wave and a traveling wave are generated through self excitation by heating the first high-temperature-side heat exchanger, the second low-temperature-side heat exchanger is cooled by the standing wave and the traveling wave, or/and a standing wave and a traveling wave are generated through self excitation by cooling the first low-temperature-side heat exchanger, and the second high-temperature-side heat exchanger is heated by the standing wave and the traveling wave, the thermoacoustic apparatus characterized in that

the loop tube is configured to include a plurality of linear tube portions, which stand relative to the ground, and connection tube portions shorter than the linear tube portions, and the first stack is disposed in the longest linear tube portion among the plurality of linear tube portions.

2. The thermoacoustic apparatus according to Claim 1,

wherein when the lengths of the linear tube portion and the connection tube portion are assumed to be La and Lb, respectively, La and Lb are set within the range satisfying

$1:0.01 \leq La:Lb < 1:1$.

3. The thermoacoustic apparatus according to Claim 1, in which a standing wave and a traveling wave are generated through self excitation by heating the first high-temperature-side heat exchanger, and the second low-temperature-side heat exchanger is cooled by the standing wave and the traveling wave, wherein the first stack is disposed below the center of the linear tube portion.

4. The thermoacoustic apparatus according to Claim 1, in which a standing wave and a traveling wave are generated through self excitation by cooling the first low-temperature-side heat exchanger, and the second high-temperature-side heat exchanger is heated by the standing wave and the traveling wave, wherein the first stack is disposed above the center of the linear tube portion.

5. The thermoacoustic apparatus according to Claim 1, wherein when one end of the linear tube portion is connected to one end of the connection tube portion, an intersection of the respective center axes is assumed to be a start point of a circuit, and an entire length of the circuit is assumed to be 1.00, the center of the first stack is set at a position corresponding to 0.28 ± 0.05 relative to the entire

length of the circuit.

6. The thermoacoustic apparatus according to Claim 1, wherein when an entire length of the circuit is assumed to be 1.00, a first peak of the pressure variation of a working fluid along the circuit is present in the vicinity of the first stack, and a second peak is present at a position corresponding to about one-half the entire length of the circuit, the second stack is disposed in such a way that the center of the second stack is positioned past the second peak.

7. The thermoacoustic apparatus according to Claim 1, wherein an acoustic wave generator for generating the standing wave and the traveling wave is disposed on the outer perimeter portion or in the inside of the loop tube.

8. The thermoacoustic apparatus according to Claim 1, wherein the first stack or/and the second stack include connection channels arranged in such a way that the inner diameters of individual connection channels are increased one after another as the position of the connection channel approaches the outside.

9. The thermoacoustic apparatus according to Claim 1, wherein the first stack or/and the second stack include connection channels arranged in such a way that the inner diameters of individual connection channels are decreased one after another as the position of the connection channel

approaches the outside.

10. The thermoacoustic apparatus according to Claim 1, wherein the first stack or/and the second stack include meandering connection channels.

11. The thermoacoustic apparatus according to Claim 1, wherein the first stack or/and the second stack include connection channels arranged in such a way that the flow path lengths of individual connection channels are decreased one after another as the position of the connection channel approaches the outside.

12. The thermoacoustic apparatus according to Claim 1, wherein a material for the first stack or/and the second stack is composed of at least one type of ceramic, sintered metal, gauze, and nonwoven metal fabric, and the $\omega\tau$ (ω: an angular frequency of the working fluid, τ: temperature relaxation time) thereof is configured to become within the range of 0.2 to 20.

13. A thermoacoustic system comprising a plurality of thermoacoustic apparatuses according to any one of Claims 1 to 12, wherein a second low-temperature-side heat exchanger in one thermoacoustic apparatus is connected to a first low-temperature-side heat exchanger in another thermoacoustic apparatus adjacent thereto, or a second high-temperature-side heat exchanger in one thermoacoustic apparatus is connected to a first high-temperature-side heat exchanger in

another thermoacoustic apparatus adjacent thereto.